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**TITLE: Bonding apparatus for use in electrical connection of
semiconductor
chip and substrate**

PATENT-ASSIGNEE: SANYO ELECTRIC CO LTD[SAOL]

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ABSTRACTED-PUB-NO: JP2000091360A

**BASIC-ABSTRACT: NOVELTY - Two valves open or close to
respectively perform
vacuum suction of a bonding head (26) and a semiconductor chip by a
head
retainer (28) and the bonding head. The chip adsorption valve opens
to absorb
the chip, when an elevating mechanism descends the head retainer
making the
head contact to a stage surface. A CPU controls the adsorption valves
so that**

the head retainer operates after the vacuum suction of the head.

DETAILED DESCRIPTION - The stage surface functions as a standard for plain surface washing by making the bonding head contact the adsorption surface of the semiconductor chip. The elevation of the head retainer is performed by the elevating mechanism based on the contact condition of the bonding head to the semiconductor chip. An INDEPENDENT CLAIM is also included for a plain-washing procedure of bonding head.

USE - For use in electrical connection of semiconductor chip and substrate.

ADVANTAGE - Enables reliable adjustment of plain surface washing of bonding head since deviation of angular position of absorbed stage surface on the bonding head due to application of shock can be prevented.

DESCRIPTION OF DRAWING(S) - The figure shows the front elevation view of the head mechanism of a bonding apparatus.

Bonding head 26

Head retainer 28

CHOSEN-DRAWING: Dwg.1/4

TITLE-TERMS:

BOND APPARATUS ELECTRIC CONNECT SEMICONDUCTOR CHIP SUBSTRATE

DERWENT-CLASS: P56 U11 V04

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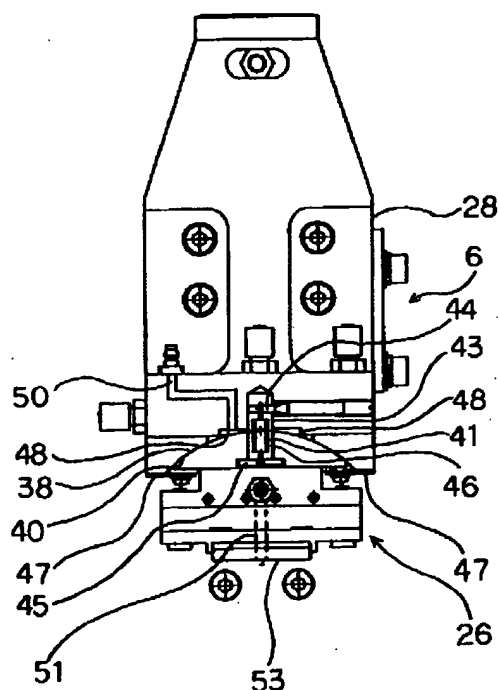
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(54) 【発明の名称】 ボンディング装置及びボンディングヘッドの平面出し方法

(57) 【要約】

【課題】 ボンディングヘッドの平面出しの調整を確実にこなう。

【解決手段】 昇降装置3によりヘッド部6が下降してボンディングヘッド26がステージ面62に当接する直前にチップ吸着用バルブ56がONしてチップ吸着面53がステージ面62を吸着して平面出しの調整がされる。その後、ヘッド吸着用バルブ55をONしてボンディングヘッド26をヘッド保持部28が平面出しがされた状態で吸着保持する。



【特許請求の範囲】

【請求項1】 ボンディングヘッドが真空吸着する半導体チップを基板にボンディングするものであり、真空吸引により前記ボンディングヘッドを保持固定するヘッド保持部と、該ヘッド保持部の真空吸引の解除時にボンディングヘッドのヘッド保持部に対する保持角度位置を変更可能とする保持角度変更機構とを有するボンディング装置において、

前記ボンディングヘッドの半導体チップの吸着面を当接することにより平面出しを行なうための基準となるステージ面と、前記ヘッド保持部を昇降させる昇降手段と、前記ボンディングヘッドによる半導体チップの真空吸引及びその解除をさせるため開閉するチップ吸着用バルブと、前記ヘッド保持部によるボンディングヘッドの真空吸引及びその解除をさせるため開閉するヘッド吸着用バルブと、前記昇降手段がヘッド保持部を下降させた時前記ボンディングヘッドが前記ステージ面に当接する前に前記チップ吸着用バルブを開き真空吸着をするようにし、その後ヘッド保持部が前記ボンディングヘッドを真空吸引するようチップ吸着用バルブ及びヘッド吸着用バルブを制御する制御手段とを設けたことを特徴とするボンディング装置。

【請求項2】 前記保持角度変更機構は、ヘッド保持部またはボンディングヘッドに形成したならい面と、該ならい面に沿って相対的に移動可能であり前記保持部がボンディングヘッドを真空吸引したときに該ならい面に係合してヘッド保持部にボンディングヘッドを角度位置決めする係合部とからなることを特徴とする請求項1に記載のボンディング装置。

【請求項3】 前記ならい面は球面の一部であることを特徴とする請求項2に記載のボンディング装置。

【請求項4】 ヘッド保持部の真空吸引の解除時にボンディングヘッドの吸着面を基準となるステージ面に当接させ、ヘッド保持部に対する保持角度位置を変更して、再度ヘッド保持部でボンディングヘッドを真空吸引して保持しボンディングヘッドの平面出しを行なうボンディングヘッドの平面出し方法において、ヘッド保持部を下降させるヘッド下降工程と、前記ボンディングヘッドにステージ面を真空吸着させるステージ面吸着工程と、その後ヘッド保持部に前記ボンディングヘッドを真空吸引させ平面出しされた角度位置のボンディングヘッドを保持するヘッド保持工程とを設けたことを特徴とするボンディングヘッドの平面出し方法。

【発明の詳細な説明】

【0001】

【発明の属する技術分野】本発明は、ボンディングヘッドが真空吸着する半導体チップを基板にボンディングするボンディング装置及びそのボンディングヘッドの吸着面をステージ面に当接させ、ヘッド保持部に対する保持角度位置を変更して、再度ヘッド保持部でボンディング

ヘッドを真空吸引して保持しボンディングヘッドの平面出しを行なうボンディングヘッドの平面出し方法に関する。

【0002】

【従来の技術】この種ボンディング装置の従来技術によれば、ボンディングヘッドの吸着面の平面出しをすることはウェハから切り出された半導体チップ（ダイ）をリードフレームまたは基板等に装着する際にその装着精度を保つために重要である。しかし、ボンディングヘッドの平行度を出して加工作成するの非常に難しくまた、チップの種類により交換する必要がある、その交換の際にその吸着面の平行度が出なくなってしまうことがある。このため、ボンディングヘッドの吸着面の平行度を装着しようとする基板面に合わせて調整する（平面出しをする）必要がある。

【0003】このため、例えばボンディングヘッドの上部に球面状のならい面を形成して、ボンディングヘッドを保持するヘッド保持部にこのならい面を真空吸引する吸引口を設けて、吸引して保持するようにしている。即ち、ヘッド保持部にならい面が係合する係合部を形成してならい面がこの係合部に沿って移動することにより、ボンディングヘッドの角度が変更され、平行出しの調整が行なえる。この平行出しの調整はボンディングヘッドのチップの吸着面を基準となるステージ面に当接させてからこの位置を保持すべくヘッド保持部の真空吸引でボンディングヘッドを吸着保持して固定される。

【0004】

【発明が解決しようとする課題】しかし、前記従来技術では、時間をある程度かけてボンディングヘッドがステージ面に当接してこの平行度を維持した状態でヘッド保持部により吸着する必要がある、また、ヘッド保持部がボンディングヘッドを真空吸引するときにそのショックで平行度がずれる恐れがある。

【0005】そこで本発明は、ボンディングヘッドの平面出しの調整を確実に行なうことを目的とする。

【0006】

【課題を解決するための手段】このため本発明は、ボンディングヘッドが真空吸着する半導体チップを基板にボンディングするものであり、真空吸引により前記ボンディングヘッドを保持固定するヘッド保持部と、該ヘッド保持部の真空吸引の解除時にボンディングヘッドのヘッド保持部に対する保持角度位置を変更可能とする保持角度変更機構とを有するボンディング装置において、前記ボンディングヘッドの半導体チップの吸着面を当接することにより平面出しを行なうための基準となるステージ面と、前記ヘッド保持部を昇降させる昇降手段と、前記ボンディングヘッドによる半導体チップの真空吸引及びその解除をさせるため開閉するチップ吸着用バルブと、前記ヘッド保持部によるボンディングヘッドの真空吸引及びその解除をさせるため開閉するヘッド吸着用バルブ

と、前記昇降手段がヘッド保持部を下降させた時前記ボンディングヘッドが前記ステージ面に当接する前に前記チップ吸着用バルブを開き真空吸着をするようにし、その後ヘッド保持部が前記ボンディングヘッドを真空吸引するようチップ吸着用バルブ及びヘッド吸着用バルブを制御する制御手段とを設けたものである。

【0007】また本発明は、保持角度変更機構を、ヘッド保持部またはボンディングヘッドに形成したならい面と、該ならい面に沿って相対的に移動可能であり前記保持部がボンディングヘッドを真空吸引したときに該ならい面に係合してヘッド保持部にボンディングヘッドを角度位置決めする係合部とから構成したものである。

【0008】また本発明は、ならい面を球面の一部としたものである。

【0009】また本発明は、ヘッド保持部の真空吸引の解除時にボンディングヘッドの吸着面を基準となるステージ面に当接させ、ヘッド保持部に対する保持角度位置を変更して、再度ヘッド保持部でボンディングヘッドを真空吸引して保持しボンディングヘッドの平面出しを行なうボンディングヘッドの平面出し方法において、ヘッド保持部を下降させるヘッド下降工程と、前記ボンディングヘッドにステージ面を真空吸着させるステージ面吸着工程と、その後ヘッド保持部に前記ボンディングヘッドを真空吸引させ平面出しされた角度位置のボンディングヘッドを保持するヘッド保持工程とを設けたものである。

【0010】

【発明の実施の形態】以下本発明の一実施形態を図に基づき詳述する。

【0011】図2はボンディング装置であるダイボンダ1の主要部の側面図であり、同図に示すように、ダイボンダ1は、機台2に支持された昇降装置3と、昇降装置3により昇降されると共に、ユニット本体5と2個のヘッド部6、6とから成るヘッドユニット4と、2個のヘッド部6、6を、ユニット本体5に係合させる係合位置と半導体チップCを吸着する吸着位置との間で巡回搬送するヘッド搬送装置7とで構成されている。ダイボンダ1に半導体チップCが供給されると、吸着位置に巡回したヘッド部6がこの半導体チップCを吸着する。続いて、ヘッド部6はヘッド搬送装置7により係合位置に搬送され、ユニット本体5に係合する。ここで、昇降装置3が駆動し、ヘッドユニット4を下降させて、吸着した半導体チップCを基板B上にボンディングする。

【0012】昇降装置3は、機台2に固定された昇降モータ11と、カップリング12を介して昇降モータ11に回転自在に取り付けられたボールねじ13とで構成されている。ボールねじ13は、後述するヘッドユニット4の雌ねじ部材21に螺合しており、昇降モータ11が正逆回転することにより、ボールねじ13および雌ねじ部材21を介して、ヘッドユニット4がボンディングの

ために昇降する。

【0013】ヘッドユニット4のユニット本体5は、係合位置におけるヘッド部6と係合する係合爪15と、下端をヘッド部6の上端に突き当てるように配設した伝達ロッド16と、下端部に係合爪15を保持すると共に、伝達ロッド16を上下方向に摺動自在に支持する支持アーム17と、伝達ロッド16の上端に当接したロードセル18と、ロードセル18を保持すると共にロードセル18の上側に配設したエアシリンダ19と、下部でエアシリンダ19および支持アーム17を支持すると共に、上部で上記の雌ねじ部材21を支持する枠部材20とで、構成されている。

【0014】枠部材20および支持アーム17は、機台2に固定した主ガイドレール22に摺動自在に係合しており、昇降モータ11の回転により主ガイドレール22に案内されて昇降する。主ガイドレール22の下部にはストッパプレート23が固定され、ストッパプレート23の先端は、ホーム位置まで上昇した係合爪15に当接するようになっている。係合爪15は、図示反時計回りに付勢された状態で、支持アーム17に回転自在に取り付けられており、その先端にヘッド部6の上端部に形成した突当て部を掛け止めしている。

【0015】より具体的には、ヘッド部6の突当て部24は、その上側に臨む伝達ロッド16と下側に臨む係合爪15とにより挟持され、この状態で昇降する。また、その昇降動作において、ユニット本体5がホーム位置まで上昇すると、係合爪15がストッパプレート23に突き当たり、さらにユニット本体5が上昇端位置まで上昇する過程で、係合爪15が回転して、ヘッド部6を置き去るようにその突当て部24との掛止め状態を解くようになっている。

【0016】伝達ロッド16は、ロードセル18を介してヘッド部6とエアシリンダ19を連結するものであり、ヘッド部6が半導体チップCをボンディングする際に受ける反力を、ロードセル18を介してエアシリンダ19に伝達する。すなわち、エアシリンダ19は、ヘッド部6にボンディング圧を付与するものであり、その圧力を付与する際に、ロードセル18はボンディング圧を検出する。ヘッドユニット4が下降してボンディング動作に移ると、エアシリンダ19により、ヘッド部6にボンディング圧が付与される。ここで、ロードセル18が所定のボンディング圧を検出すると、図外のコントローラおよび空圧回路を介して、エアシリンダ19の作動エアが抜かれる（圧力降下）と共に、ヘッド部6が上昇動作に移行する。

【0017】ヘッド搬送装置7は、2つのヘッド部6、6を180度点対称位置に支持するヘッドホルダ31と、ヘッドホルダ31を回転自在に支持する支持テーブル32と、ベルト33を介してヘッドホルダ31を回転させる搬送モータ（図示省略）とを、有している。ヘッ

ドホルダ31は、上下に重ねて配設した一对の軸受34、34を介して、機台2に固定した支持テーブル32に回転自在に支持されている。そして、搬送モータが正逆回転することにより、ベルト33を介してヘッドホルダ31が、角度180度、往復回転する。これにより、吸着位置で半導体チップCを吸着した一方のヘッド部6は、回転（公転）して係合位置に搬送され、またボンディングを完了して係合位置にある他方のヘッド部6は、回転（公転）して吸着位置に搬送される。

【0018】支持テーブル32の下部周面には、断面「コ」字状の環状ガイド溝35が形成されており、各ヘッド部6は、ローラ25を介してこの環状ガイド溝35に案内されて回転（公転）する。また、環状ガイド溝35における係合位置側の部位は、下側の部材が切り欠かれており、ヘッド部6は、この部分から離脱して下降する。すなわち、ヘッド部6が吸着位置から係合位置に移動するときには、ユニット本体5は上昇端位置にあり、係合爪15とヘッド部6との係合状態は解かれている。ヘッド搬送装置7が駆動すると、一对のヘッド部6、6は環状ガイド溝35に案内されて、同時に回転（公転）する。この両ヘッド部6、6の旋回搬送が完了すると、ユニット本体5は上昇端位置から下降を開始し、ホーム位置を通過したところでヘッド部6を挟持し、さらにボンディングのために下降する。なお、図中の符号36は、ヘッド部6の下降を案内する副ガイドレールであり、符号26は、半導体チップCを吸着するためにヘッド部6の下端に装着したボンディングヘッドである。

【0019】以下に、ヘッド部6について、図1及び図3に基づいて説明する。

【0020】ヘッド部6はボンディングヘッド26及びボンディングヘッド26を保持するヘッド保持部28から構成されているが、ボンディングヘッド26の上部には凸面で球面形状のならい面38が形成され、ヘッド保持部28の下面に該ならい面と同一半径の球面形状になされた係合部としての係合面40が形成され、ならい面38には係合面40が隙間無く嵌合し、さらにはその球面の中心を中心としてならい面38が全ての方向に揺動可能になされている。

【0021】ボンディングヘッド26のならい面38の上部には穴部41が開口しており、また、ヘッド保持部28の対向する位置にも穴部43が開口している。ヘッド保持部28の穴部43内の支持アーム44と穴部41内の支持棒45との間には引張りバネ46が穴部41、43を通過して掛け渡され、該バネによりボンディングヘッド26は吊り下げられている。また、ヘッド保持部28の下部にはボンディングヘッド26の落下を防止する落下防止板47が取り付けられている。

【0022】ヘッド保持部28のならい面38に対向する部分には、ならい面38が係合面40に密着した場合にも隙間となる凹部48が刻設されている。該凹部48

にはヘッド吸着真空通路50が開口しており、図示しない真空源に連通してボンディングヘッド26を真空吸引してヘッド保持部28に保持固定させる役割を果たし、前記凹部48は真空室を形成する。従って、ボンディングヘッド26はならい面38が平面視任意の方向に側方から見て任意の角度傾いた位置で固定することができる。

【0023】また、図3に示すように、チップ吸着真空通路51がボンディングヘッド26のチップ吸着面53に開口している。

【0024】次に、図4に基づきダイボンダ1の制御ブロックについて説明する。

【0025】前記ヘッド吸着真空通路50はヘッド吸着用バルブ55に連通しており、また、チップ吸着真空通路51はチップ吸着用バルブ56に連通しており、夫々のバルブ55、56はON/OFFして真空吸引及びその解除を切り替える。

【0026】該バルブ55、56は夫々、インターフェース57を介してCPU58にその切替が制御される。CPU58はRAM59に格納された各種データに基づきROM60に記憶されたプログラムに従って、ダイボンダ1の所与の制御を行なう。

【0027】また、前記インターフェース57には前記昇降モータ11が接続されている。

【0028】以下動作について説明する。

【0029】先ず、ボンディングヘッド26のチップ吸着面53の平面出し（平行出し）の動作について説明する。

【0030】この動作はダイボンダ1への電源の投入時等に行われる。

【0031】即ち、昇降モータ11の駆動によりヘッド部6が副ガイドレール36に沿って下降する。このとき、バルブ55及びバルブ56はOFFであり、真空通路50、51は真空吸引をしておらず、ボンディングヘッド26はバネ46のみで吊り下げられた状態である。

【0032】次に、ヘッド26が基板Bが載置されていないステージ面62に当接する直前にチップ吸着用バルブ56がONして、吸着面53がステージ面62に当接した時にボンディングヘッド26がステージ面62を吸着し、吸着面53がステージ面62に対して平行になる。このとき、この動きに合わせて、ならい面38が係合面40と位置合わせされている。

【0033】次に、ヘッド吸着用バルブ55がONされ、ヘッド吸着真空通路51が真空吸引を開始し、ボンディングヘッド26がヘッド保持部28にならい面38と係合面40との位置関係を変えずに固定される。このとき、吸着面53はステージ面62を吸着しており、ヘッド吸着真空通路51の真空吸引によるショックやその他の振動等があったとしても、平面出しが正確に行われた状態でボンディングヘッド26の固定がされる。

【0034】次に、チップ吸着用バルブ56がOFFにされ、チップ吸着真空通路51の真空が解除される。

【0035】このようにして、ボンディングヘッド26の平面出しが終了する。

【0036】上記平面出しの動作はその手順をROM60等にプログラムして、電源の投入後CPU58の制御で自動的に行われるようにしてもよいし、作業者が平面出し動作の指示をすることで、そのプログラムに従って、CPU58が制御するようにしてもよいし、バルブ55、56のON、OFFを作業者がスイッチ等で切り替えることにより、実現してもよい。

【0037】次に、平面出し動作が終了した後、基板Bがステージ面62上に載置され、半導体チップC吸着したボンディングヘッド26がヘッドホルダ31の回転により装着位置に移動する。

【0038】次に、ヘッド部6は昇降モータ11の回転により下降して半導体チップCは基板B上に載置される。

【0039】

【発明の効果】以上のように本発明は、ボンディングヘッドがステージ面を吸着して固定された状態でヘッド保持部がボンディングヘッドの吸着をするのでショックで角度位置がずれてしまうことなく、確実な平面出しを行

なうことができる。

【図面の簡単な説明】

【図1】ヘッド部を示す正面図である。

【図2】ヘッド部を備えたダイボンダの側面図である。

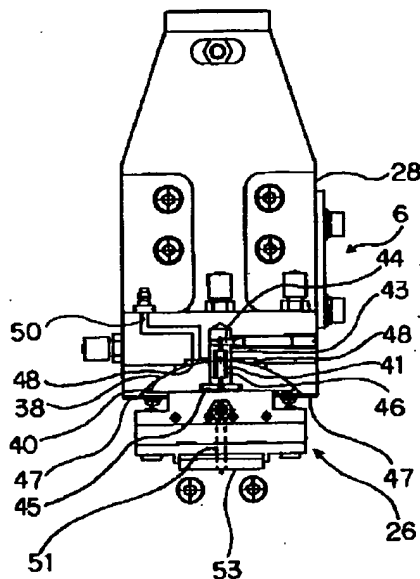
【図3】ヘッド部を示す側面図である。

【図4】ダイボンダの制御ブロック図である。

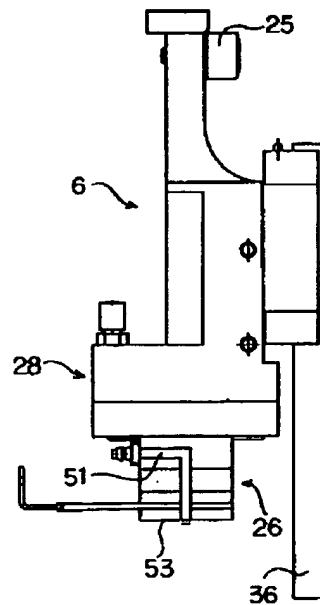
【符号の説明】

3	昇降装置（昇降手段）
6	ヘッド部
26	ボンディングヘッド
28	ヘッド保持部
38	ならい面（保持角度変更機構）
40	係合面（保持角度変更機構）
41	穴部（保持角度変更機構）
43	穴部（保持角度変更機構）
44	支持アーム（保持角度変更機構）
45	支持棒（保持角度変更機構）
46	引張りバネ（保持角度変更機構）
53	チップ吸着面
55	ヘッド吸着用バルブ
56	チップ吸着用バルブ
58	CPU（制御手段）
62	ステージ面

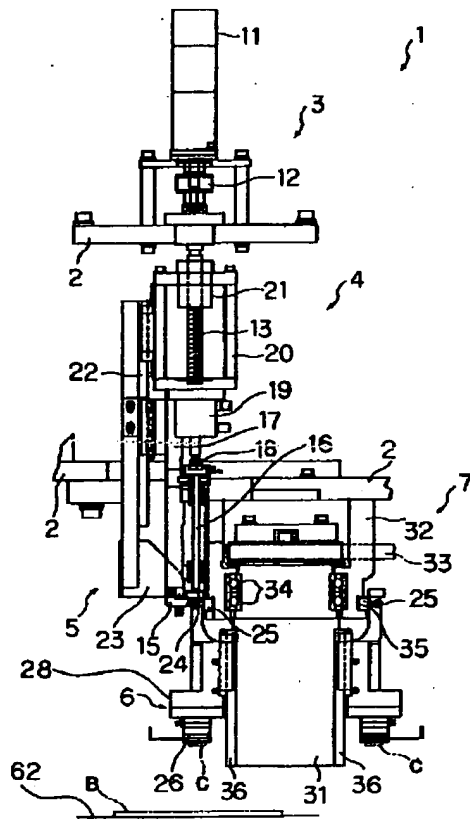
【図1】



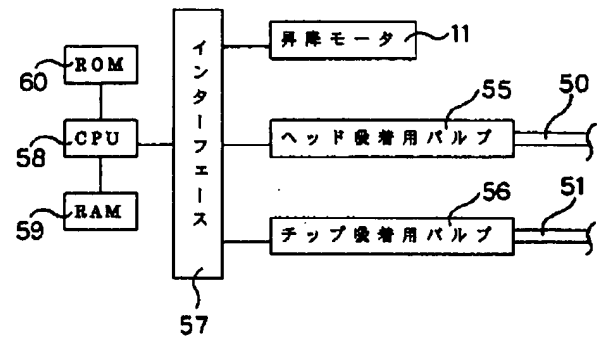
【図3】



【図2】



【図4】



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DETAILED DESCRIPTION

[Detailed Description of the Invention]

[0001]

[The technical field to which invention belongs] this invention relates to how to carry out flat-surface appearance of the bonding head which the bonding equipment which carries out bonding of the semiconductor chip which carries out vacuum adsorption to a substrate, and the adsorption side of the bonding head are made to contact a stage side, the maintenance angular position to a head attaching part is changed, a bonding head carries out vacuum suction, holds a bonding head by the head attaching part again, and performs flat-surface **** of a bonding head

[0002]

[Description of the Prior Art] According to the conventional technology of this seed bonding equipment, it is important to carry out flat-surface **** of the adsorption side of a bonding head in order to maintain the wearing precision, in case a leadframe or a substrate is equipped with the semiconductor chip (dic) started from the wafer. however, the parallelism of a bonding head is taken out and processing creation is carried out -- it is necessary to exchange according to the kind of chip, and in case it is the exchange, the parallelism of the adsorption side may stop coming out very difficultly again For this reason, there is the need (flat-surface **** is carried out) of adjusting according to the substrate side which is going to equip with the parallelism of the adsorption side of a bonding head.

[0003] for this reason -- for example, the shape of the spherical surface learns from the upper part of a bonding head, a field is formed, this suction mouth that learns and carries out vacuum suction of the field is prepared and attracted to the head attaching part holding a bonding head, and it is made to hold That is, when the engagement section with which it learns from a head attaching part and a field engages is formed and learned and a field moves along with this engagement section, the angle of a bonding head is changed and parallel **** can be adjusted. After adjustment of this parallel **** is making the adsorption side of the chip of a bonding head contact the stage side used as criteria, that this position should be held, by vacuum suction of a head attaching part, adsorption maintenance of the bonding head is carried out, and it is fixed.

[0004]

[Problem(s) to be Solved by the Invention] however, with the aforementioned conventional technology, when it is necessary to adsorb by the head attaching part and after the bonding head has maintained this parallelism in contact with a stage side, having spent many hours to some extent, and a head attaching part carries out vacuum suction of the bonding head, it is alike, and it is shocking and the possibility that parallelism may shift exists

[0005] Then, this invention aims at ensuring adjustment of flat-surface **** of a bonding head.

[0006]

[Means for Solving the Problem] For this reason, the head attaching part which this invention carries out bonding of the semiconductor chip in which a bonding head carries out vacuum adsorption to a substrate, and carries out maintenance fixation of the aforementioned bonding head by vacuum suction, In the bonding equipment which has the maintenance angle change mechanism whose change of the maintenance angular position to the head attaching part of a bonding head is enabled at the time of release of vacuum suction of this head attaching part The stage side used as the criteria for performing flat-surface **** by contacting the adsorption side of the semiconductor chip of the aforementioned bonding head, A rise-and-fall means to make it go up and down the aforementioned head attaching part, and the chip suction valve which are opened and closed in order to carry out vacuum suction and its release of the semiconductor chip by the aforementioned bonding head, The head suction valve opened and closed in order to carry out vacuum suction and its release of the bonding head by the aforementioned head attaching part, When the aforementioned rise-and-fall means drops a head attaching part, before the aforementioned bonding head contacts the aforementioned stage side, the aforementioned chip suction valve is opened and it is made to carry out vacuum adsorption. The control means which control a chip suction valve and a head suction valve so that a head attaching part carries out vacuum suction of the aforementioned bonding head after that are prepared.

[0007] Moreover, it learns and this invention consists of the engagement sections which engage with this oak **** and carry out the angular-position arrangement of the bonding head at a head attaching part when [at which the maintenance angle change mechanism was formed in the head attaching part or the bonding head] it can move relatively along with a field and this oak **** and the aforementioned attaching part carries out vacuum suction of the bonding head.

[0008] Moreover, this invention is learned and makes a field a part of spherical surface.

[0009] Moreover, this invention makes the adsorption side of a bonding head contact the stage side used as criteria at the time of

release of vacuum suction of a head attaching part, and the maintenance angular position to a head attaching part is changed. In how to carry out flat-surface appearance of the bonding head which carries out vacuum suction, holds a bonding head by the head attaching part again, and performs flat-surface **** of a bonding head The head downward process of dropping a head attaching part, and the stage side adsorption process which makes the aforementioned bonding head carry out vacuum adsorption of the stage side, the head maintenance process of holding the bonding head of the angular position which the head attaching part was made carrying out vacuum suction of the aforementioned bonding head, and was made into it by carrying out flat-surface appearance after that is established

[0010]

[Embodiments of the Invention] 1 operation gestalt of this invention is explained in full detail based on drawing below.

[0011] As drawing 2 is the side elevation of the principal part of the die bonder 1 which is bonding equipment and it is shown in this drawing, a die bonder 1 While going up and down by the lifting device 3 supported by **** 2 and the lifting device 3 It consists of head transport devices 7 which carry out revolution conveyance between the head unit 4 which consists of the unit main part 5 and the two head sections 6 and 6, and the engagement position which makes the two head sections 6 and 6 engage with the unit main part 5 and the adsorption position which adsorbs semiconductor chip C. If semiconductor chip C is supplied to a die bonder 1, the head section 6 which circled in the adsorption position will adsorb this semiconductor chip C. Then, the head section 6 is conveyed by the head transport device 7 in an engagement position, and engages with the unit main part 5. Here, a lifting device 3 drives, the head unit 4 is dropped, and bonding of the semiconductor chip C to which it stuck is carried out on Substrate B.

[0012] The lifting device 3 consists of a rise-and-fall motor 11 fixed to **** 2, and a ball thread 13 attached in the rise-and-fall motor 11 free [rotation] through distributor shaft coupling 12. The ball thread 13 is screwed in the female thread-part material 21 of the head unit 4 mentioned later, and when the rise-and-fall motor 11 right-rotates reversely, the head unit 4 goes up and down through a ball thread 13 and the female thread-part material 21 for bonding.

[0013] While the unit main part 5 of the head unit 4 holds the engagement presser foot stitch tongue 15 in the engagement presser foot stitch tongue 15 which engages with the head section 6 in an engagement position, the transfer rod 16 arranged so that a soffit might be dashed against the upper limit of the head section 6, and the soffit section The support arm 17 which supports the transfer rod 16 free [sliding of the vertical direction], With the load cell 18 which contacted the upper limit of the transfer rod 16, and the pneumatic cylinder 19 arranged in the load cell 18 bottom while holding the load cell 18, while supporting a pneumatic cylinder 19 and the support arm 17 in the lower part the female screw above-mentioned in the upper part -- the frame which supports a member 21 -- it consists of members 20

[0014] a frame -- the member 20 and the support arm 17 are engaging with the main guide rail 22 fixed to **** 2 free [sliding], are guided by rotation of the rise-and-fall motor 11 at the main guide rail 22, and go up and down The stopper plate 23 is fixed to the lower part of the main guide rail 22, and the nose of cam of the stopper plate 23 contacts the engagement presser foot stitch tongue 15 which went up to the home position. The engagement presser foot stitch tongue 15 is in the state energized at the circumference of an illustration anti-clock, is attached in the support arm 17 free [rotation], and is hanging, stopping and carrying out ***** formed at the nose of cam at the upper-limit section of the head section 6.

[0015] More specifically, ***** 24 of the head section 6 is pinched by the transfer rod 16 which attends the bottom, and the engagement presser foot stitch tongue 15 which attends the bottom, and goes up and down in this state. Moreover, in the rise-and-fall operation, if the unit main part 5 goes up to a home position, the engagement presser foot stitch tongue 15 runs against the stopper plate 23, and the engagement presser foot stitch tongue 15 will rotate, and a latch state with the ***** 24 will be dispelled in process in which the unit main part 5 goes up to elevation end position further so that the head section 6 may be placed away.

[0016] The transfer rod 16 connects a pneumatic cylinder 19 with the head section 6 through a load cell 18, and transmits the reaction force received in case the head section 6 carries out bonding of the semiconductor chip C to a pneumatic cylinder 19 through a load cell 18. That is, in case a pneumatic cylinder 19 gives bonding ** to the head section 6 and the pressure is given, a load cell 18 detects bonding **. Bonding ** will be given to the head section 6 by the pneumatic cylinder 19, if the head unit 4 descends and it moves to bonding operation. here, if a load cell 18 detects predetermined bonding **, the operation air of a pneumatic cylinder 19 will extract through the controller and pneumatics circuit outside drawing -- having (pressure drawdown) -- the head section 6 shifts to elevation operation

[0017] The head transport device 7 has the head electrode holder 31 which supports the two head sections 6 and 6 in a point-symmetry position 180 degrees, the support table 32 supported free [rotation of the head electrode holder 31], and the conveyance motor (illustration ellipsis) made to rotate the head electrode holder 31 through a belt 33. The head electrode holder 31 is supported free [rotation] by the support table 32 fixed to **** 2 through the bearing 34 and 34 of the couple arranged in piles up and down. And when a conveyance motor right-rotates reversely, the head electrode holder 31 carries out both-way rotation 180 angles through a belt 33. Thereby, the head section 6 of another side which the head section 6 rotates (revolution), and is conveyed in an engagement position, and completes bonding, and is located in an engagement position while semiconductor chip C was adsorbed in the adsorption position rotates (revolution), and is conveyed in an adsorption position.

[0018] The cross-section "KO" character-like annular guide slot 35 is formed in the lower peripheral surface of the support table 32, and through a roller 25, into this annular guide slot 35, each head section 6 is guided and rotates (revolution). Moreover, the lower member cuts and lacks the part by the side of the engagement position in the annular guide slot 35, and the head section 6 secedes from this portion, and descends. That is, when the head section 6 moves to an engagement position from an adsorption

position, the unit main part 5 is in elevation end position, and the engagement state of the engagement presser foot stitch tongue 15 and the head section 6 is dispelled. If the head transport device 7 drives, the head sections 6 and 6 of a couple will be guided in the annular guide slot 35, and will rotate simultaneously (revolution). If revolution conveyance of both these head sections 6 and 6 is completed, the unit main part 5 will start descent from elevation end position, will pinch the head section 6 in the place which passed through the home position, and will descend further for bonding. In addition, the sign 36 in drawing is a subguide rail to which it shows descent of the head section 6, and in order that a sign 26 may adsorb semiconductor chip C, it is the bonding head with which the soffit of the head section 6 was equipped.

[0019] Below, the head section 6 is explained based on drawing 1 and drawing 3.

[0020] Although the head section 6 consists of head attaching parts 28 holding a bonding head 26 and a bonding head 26 A spherical-surface configuration learns from the upper part of a bonding head 26 in a convex, and a field 38 is formed. The engagement side 40 as the engagement section made by the spherical-surface configuration of the same radius as this oak **** is formed in the inferior surface of tongue of the head attaching part 28, and it learns, and the engagement side 40 fits into a field 38 without a crevice, it learns centering on the center of the spherical surface further, and the field 38 is made by the rockable in all the directions.

[0021] The hole 43 is carrying out opening also to the position where a bonding head 26 learns, and the hole 41 is carrying out opening to the upper part of a field 38, and the head attaching part 28 counters. It pulls between the support arm 44 in the hole 43 of the head attaching part 28, and the bearing bar 45 in a hole 41, and it is built over a spring 46 through holes 41 and 43, and the bonding head 26 is hung with this spring. Moreover, the fall prevention board 47 which prevents fall of a bonding head 26 is attached in the lower part of the head attaching part 28.

[0022] When it learns and a field 38 sticks to the engagement side 40, the crevice 48 used as a crevice is engraved on the portion which the head attaching part 28 learns and counters a field 38. The head adsorption vacuum path 50 is carrying out opening to this crevice 48, it is open for free passage in the source of a vacuum which is not illustrated, and vacuum suction of the bonding head 26 is carried out, the role which carries out maintenance fixation is played in the head attaching part 28, and the aforementioned crevice 48 forms a vacuum chamber in it. Therefore, a bonding head 26 learns, and a field 38 can see it in the direction of plane view arbitration from the side, and can fix it to it in the arbitrary positions to which it inclined the degree of angle.

[0023] Moreover, as shown in drawing 3, the chip adsorption vacuum path 51 is carrying out opening to the chip adsorption side 53 of a bonding head 26.

[0024] Next, control block of a die bonder 1 is explained based on drawing 4.

[0025] The aforementioned head adsorption vacuum path 50 is open for free passage to the head suction valve 55, and the chip adsorption vacuum path 51 is open for free passage to the chip suction valve 56, ON/OFF of each bulb 55 and 56 is carried out, and it changes vacuum suction and its release.

[0026] As for these bulbs 55 and 56, the change is controlled by CPU58 through an interface 57, respectively. CPU58 performs given control of a die bonder 1 according to the program memorized by ROM60 based on the various data stored in RAM59.

[0027] Moreover, the aforementioned rise-and-fall motor 11 is connected to the aforementioned interface 57.

[0028] Operation is explained below.

[0029] first, operation of the chip adsorption side 53 of a bonding head 26 which carries out flat-surface appearance (carrying out parallel appearance) is explained

[0030] This operation is performed at the time of the injection of the power supply to a die bonder 1 etc.

[0031] That is, the head section 6 descends along with the subguide rail 36 by the drive of the rise-and-fall motor 11. At this time, a bulb 55 and a bulb 56 are OFF, the vacuum paths 50 and 51 do not carry out vacuum suction, but a bonding head 26 is in the state hung only with the spring 46.

[0032] Next, when the chip suction valve 56 turns on just before a head 26 contacts the stage side 62 in which Substrate B is not laid, and the adsorption side 53 contacts the stage side 62, a bonding head 26 adsorbs the stage side 62, and the adsorption side 53 becomes parallel to the stage side 62. At this time, according to this movement, it learns and alignment of the field 38 is carried out to the engagement side 40.

[0033] Next, the head suction valve 55 is turned on, the head adsorption vacuum path 51 starts vacuum suction, and it is fixed, without a bonding head's 26 learning from the head attaching part 28, and changing the physical relationship of a field 38 and the engagement side 40. Though the adsorption side 53 was adsorbing the stage side 62 at this time and there were a shock by vacuum suction of the head adsorption vacuum path 51, other vibration, etc., where flat-surface **** is performed correctly, fixation of a bonding head 26 is carried out.

[0034] Next, the chip suction valve 56 is turned OFF and the vacuum of the chip adsorption vacuum path 51 is canceled.

[0035] Thus, flat-surface **** of a bonding head 26 is completed.

[0036] according to the program, operation of the above-mentioned flat-surface **** programs the procedure in ROM60 grade, and may be made to be performed by the control after [CPU / 58] the injection of a power supply automatically, and it is that an operator does flat-surface appearance and directs operation, and when an operator changes ON of bulbs 55 and 56, and OFF with a switch etc., you may realize [it may be made for CPU58 to control, and]

[0037] next, after carrying out flat-surface appearance and completing operation, Substrate B is laid on the stage side 62, and the bonding head 26 of which semiconductor chip C adsorption was done moves to a wearing position by rotation of the head electrode holder 31

[0038] Next, the head section 6 descends by rotation of the rise-and-fall motor 11, and semiconductor chip C is laid on Substrate B.

[0039]

[Effect of the Invention] this invention can perform positive flat-surface **** as mentioned above, without the angular position shifting with a shock, since a head attaching part adsorbs a bonding head where the bonding head adsorbed the stage side and is fixed.

[Translation done.]

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TECHNICAL FIELD

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PRIOR ART

[Description of the Prior Art] According to the conventional technology of this seed bonding equipment, it is important to carry out flat-surface **** of the adsorption side of a bonding head in order to maintain the wearing precision, in case a leadframe or a substrate is equipped with the semiconductor chip (die) started from the wafer. however, the parallelism of a bonding head is taken out and processing creation is carried out -- it is necessary to exchange according to the kind of chip, and in case it is the exchange, the parallelism of the adsorption side may stop coming out very difficultly again For this reason, there is the need (flat-surface **** is carried out) of adjusting according to the substrate side which is going to equip with the parallelism of the adsorption side of a bonding head.

[0003] for this reason -- for example, the shape of the spherical surface learns from the upper part of a bonding head, a field is formed, this suction mouth that learns and carries out vacuum suction of the field is prepared and attracted to the head attaching part holding a bonding head, and it is made to hold That is, when the engagement section with which it learns from a head attaching part and a field engages is formed and learned and a field moves along with this engagement section, the angle of a bonding head is changed and parallel **** can be adjusted. After adjustment of this parallel **** is making the adsorption side of the chip of a bonding head contact the stage side used as criteria, that this position should be held, by vacuum suction of a head attaching part, adsorption maintenance of the bonding head is carried out, and it is fixed.

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EFFECT OF THE INVENTION

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TECHNICAL PROBLEM

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MEANS

[Means for Solving the Problem] For this reason, the head attaching part which this invention carries out bonding of the semiconductor chip in which a bonding head carries out vacuum adsorption to a substrate, and carries out maintenance fixation of the aforementioned bonding head by vacuum suction, In the bonding equipment which has the maintenance angle change mechanism whose change of the maintenance angular position to the head attaching part of a bonding head is enabled at the time of release of vacuum suction of this head attaching part The stage side used as the criteria for performing flat-surface **** by contacting the adsorption side of the semiconductor chip of the aforementioned bonding head, A rise-and-fall means to make it go up and down the aforementioned head attaching part, and the chip suction valve which are opened and closed in order to carry out vacuum suction and its release of the semiconductor chip by the aforementioned bonding head, The head suction valve opened and closed in order to carry out vacuum suction and its release of the bonding head by the aforementioned head attaching part, When the aforementioned rise-and-fall means drops a head attaching part, before the aforementioned bonding head contacts the aforementioned stage side, the aforementioned chip suction valve is opened and it is made to carry out vacuum adsorption. The control means which control a chip suction valve and a head suction valve so that a head attaching part carries out vacuum suction of the aforementioned bonding head after that are prepared.

[0007] Moreover, it learns and this invention consists of the engagement sections which engage with this oak **** and carry out the angular-position arrangement of the bonding head at a head attaching part when [at which the maintenance angle change mechanism was formed in the head attaching part or the bonding head] it can move relatively along with a field and this oak **** and the aforementioned attaching part carries out vacuum suction of the bonding head.

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[0010]

[Embodiments of the Invention] 1 operation gestalt of this invention is explained in full detail based on drawing below.

[0011] As drawing 2 is the side elevation of the principal part of the die bonder 1 which is bonding equipment and it is shown in this drawing, a die bonder 1 While going up and down by the lifting device 3 supported by **** 2 and the lifting device 3 It consists of head transport devices 7 which carry out revolution conveyance between the head unit 4 which consists of the unit main part 5 and the two head sections 6 and 6, and the engagement position which makes the two head sections 6 and 6 engage with the unit main part 5 and the adsorption position which adsorbs semiconductor chip C. If semiconductor chip C is supplied to a die bonder 1, the head section 6 which circled in the adsorption position will adsorb this semiconductor chip C. Then, the head section 6 is conveyed by the head transport device 7 in an engagement position, and engages with the unit main part 5. Here, a lifting device 3 drives, the head unit 4 is dropped, and bonding of the semiconductor chip C to which it stuck is carried out on Substrate B.

[0012] The lifting device 3 consists of a rise-and-fall motor 11 fixed to **** 2, and a ball thread 13 attached in the rise-and-fall motor 11 free [rotation] through distributor shaft coupling 12. The ball thread 13 is screwed in the female thread-part material 21 of the head unit 4 mentioned later, and when the rise-and-fall motor 11 right-rotates reversely, the head unit 4 goes up and down through a ball thread 13 and the female thread-part material 21 for bonding.

[0013] While the unit main part 5 of the head unit 4 holds the engagement presser foot stitch tongue 15 in the engagement presser foot stitch tongue 15 which engages with the head section 6 in an engagement position, the transfer rod 16 arranged so that a soffit might be dashed against the upper limit of the head section 6, and the soffit section The support arm 17 which supports the transfer rod 16 free [sliding of the vertical direction], With the load cell 18 which contacted the upper limit of the transfer rod 16, and the pneumatic cylinder 19 arranged in the load cell 18 bottom while holding the load cell 18, while supporting a pneumatic cylinder 19 and the support arm 17 in the lower part the female screw above-mentioned in the upper part -- the frame which supports a member 21 -- it consists of members 20

[0014] a frame -- the member 20 and the support arm 17 are engaging with the main guide rail 22 fixed to **** 2 free [sliding], are guided by rotation of the rise-and-fall motor 11 at the main guide rail 22, and go up and down. The stopper plate 23 is fixed to the lower part of the main guide rail 22, and the nose of cam of the stopper plate 23 contacts the engagement presser foot stitch tongue 15 which went up to the home position. The engagement presser foot stitch tongue 15 is in the state energized at the circumference of an illustration anti-clock, is attached in the support arm 17 free [rotation], and is hanging, stopping and carrying out ***** formed at the nose of cam at the upper-limit section of the head section 6.

[0015] More specifically, ***** 24 of the head section 6 is pinched by the transfer rod 16 which attends the bottom, and the engagement presser foot stitch tongue 15 which attends the bottom, and goes up and down in this state. Moreover, in the rise-and-fall operation, if the unit main part 5 goes up to a home position, the engagement presser foot stitch tongue 15 runs against the stopper plate 23, and the engagement presser foot stitch tongue 15 will rotate, and a latch state with the ***** 24 will be dispelled in process in which the unit main part 5 goes up to elevation end position further so that the head section 6 may be placed away.

[0016] The transfer rod 16 connects a pneumatic cylinder 19 with the head section 6 through a load cell 18, and transmits the reaction force received in case the head section 6 carries out bonding of the semiconductor chip C to a pneumatic cylinder 19 through a load cell 18. That is, in case a pneumatic cylinder 19 gives bonding ** to the head section 6 and the pressure is given, a load cell 18 detects bonding **. Bonding ** will be given to the head section 6 by the pneumatic cylinder 19, if the head unit 4 descends and it moves to bonding operation. here, if a load cell 18 detects predetermined bonding **, the operation air of a pneumatic cylinder 19 will extract through the controller and pneumatics circuit outside drawing -- having (pressure drawdown) -- the head section 6 shifts to elevation operation

[0017] The head transport device 7 has the head electrode holder 31 which supports the two head sections 6 and 6 in a point-symmetry position 180 degrees, the support table 32 supported free [rotation of the head electrode holder 31], and the conveyance motor (illustration ellipsis) made to rotate the head electrode holder 31 through a belt 33. The head electrode holder 31 is supported free [rotation] by the support table 32 fixed to **** 2 through the bearing 34 and 34 of the couple arranged in piles up and down. And when a conveyance motor right-rotates reversely, the head electrode holder 31 carries out both-way rotation 180 angles through a belt 33. Thereby, the head section 6 of another side which the head section 6 rotates (revolution), and is conveyed in an engagement position, and completes bonding, and is located in an engagement position while semiconductor chip C was adsorbed in the adsorption position rotates (revolution), and is conveyed in an adsorption position.

[0018] The cross-section "KO" character-like annular guide slot 35 is formed in the lower peripheral surface of the support table 32, and through a roller 25, into this annular guide slot 35, each head section 6 is guided and rotates (revolution). Moreover, the lower member cuts and lacks the part by the side of the engagement position in the annular guide slot 35, and the head section 6 secedes from this portion, and descends. That is, when the head section 6 moves to an engagement position from an adsorption position, the unit main part 5 is in elevation end position, and the engagement state of the engagement presser foot stitch tongue 15 and the head section 6 is dispelled. If the head transport device 7 drives, the head sections 6 and 6 of a couple will be guided in the annular guide slot 35, and will rotate simultaneously (revolution). If revolution conveyance of both these head sections 6 and 6 is completed, the unit main part 5 will start descent from elevation end position, will pinch the head section 6 in the place which passed through the home position, and will descend further for bonding. In addition, the sign 36 in drawing is a subguide rail to which it shows descent of the head section 6, and in order that a sign 26 may adsorb semiconductor chip C, it is the bonding head with which the soffit of the head section 6 was equipped.

[0019] Below, the head section 6 is explained based on drawing 1 and drawing 3.

[0020] Although the head section 6 consists of head attaching parts 28 holding a bonding head 26 and a bonding head 26 A spherical-surface configuration learns from the upper part of a bonding head 26 in a convex, and a field 38 is formed. The engagement side 40 as the engagement section made by the spherical-surface configuration of the same radius as this oak **** is formed in the inferior surface of tongue of the head attaching part 28, and it learns, and the engagement side 40 fits into a field 38 without a crevice, it learns centering on the center of the spherical surface further, and the field 38 is made by the rockable in all the directions.

[0021] The hole 43 is carrying out opening also to the position where a bonding head 26 learns, and the hole 41 is carrying out opening to the upper part of a field 38, and the head attaching part 28 counters. It pulls between the support arm 44 in the hole 43 of the head attaching part 28, and the bearing bar 45 in a hole 41, and it is built over a spring 46 through holes 41 and 43, and the bonding head 26 is hung with this spring. Moreover, the fall prevention board 47 which prevents fall of a bonding head 26 is attached in the lower part of the head attaching part 28.

[0022] When it learns and a field 38 sticks to the engagement side 40, the crevice 48 used as a crevice is engraved on the portion which the head attaching part 28 learns and counters a field 38. The head adsorption vacuum path 50 is carrying out opening to this crevice 48, it is open for free passage in the source of a vacuum which is not illustrated, and vacuum suction of the bonding head 26 is carried out, the role which carries out maintenance fixation is played in the head attaching part 28, and the aforementioned crevice 48 forms a vacuum chamber in it. Therefore, a bonding head 26 learns, and a field 38 can see it in the direction of plane view arbitration from the side, and can fix it to it in the arbitrary positions to which it inclined the degree of angle.

[0023] Moreover, as shown in drawing 3, the chip adsorption vacuum path 51 is carrying out opening to the chip adsorption side 53 of a bonding head 26.

[0024] Next, control block of a die bonder 1 is explained based on drawing 4.

[0025] The aforementioned head adsorption vacuum path 50 is open for free passage to the head suction valve 55, and the chip adsorption vacuum path 51 is open for free passage to the chip suction valve 56, ON/OFF of each bulb 55 and 56 is carried out, and it changes vacuum suction and its release.

[0026] As for these bulbs 55 and 56, the change is controlled by CPU58 through an interface 57, respectively. CPU58 performs given control of a die bonder 1 according to the program memorized by ROM60 based on the various data stored in RAM59.

[0027] Moreover, the aforementioned rise-and-fall motor 11 is connected to the aforementioned interface 57.

[0028] Operation is explained below.

[0029] first, operation of the chip adsorption side 53 of a bonding head 26 which carries out flat-surface appearance (carrying out parallel appearance) is explained

[0030] This operation is performed at the time of the injection of the power supply to a die bonder 1 etc.

[0031] That is, the head section 6 descends along with the subguide rail 36 by the drive of the rise-and-fall motor 11. At this time, a bulb 55 and a bulb 56 are OFF, the vacuum paths 50 and 51 do not carry out vacuum suction, but a bonding head 26 is in the state hung only with the spring 46.

[0032] Next, when the chip suction valve 56 turns on just before a head 26 contacts the stage side 62 in which Substrate B is not laid, and the adsorption side 53 contacts the stage side 62, a bonding head 26 adsorbs the stage side 62, and the adsorption side 53 becomes parallel to the stage side 62. At this time, according to this movement, it learns and alignment of the field 38 is carried out to the engagement side 40.

[0033] Next, the head suction valve 55 is turned on, the head adsorption vacuum path 51 starts vacuum suction, and it is fixed, without a bonding head's 26 learning from the head attaching part 28, and changing the physical relationship of a field 38 and the engagement side 40. Though the adsorption side 53 was adsorbing the stage side 62 at this time and there were a shock by vacuum suction of the head adsorption vacuum path 51, other vibration, etc., where flat-surface **** is performed correctly, fixation of a bonding head 26 is carried out.

[0034] Next, the chip suction valve 56 is turned OFF and the vacuum of the chip adsorption vacuum path 51 is canceled.

[0035] Thus, flat-surface **** of a bonding head 26 is completed.

[0036] according to the program, operation of the above-mentioned flat-surface **** programs the procedure in ROM60 grade, and may be made to be performed by the control after [CPU / 58] the injection of a power supply automatically, and it is that an operator does flat-surface appearance and directs operation, and when an operator changes ON of bulbs 55 and 56, and OFF with a switch etc., you may realize [it may be made for CPU58 to control, and]

[0037] next, after carrying out flat-surface appearance and completing operation, Substrate B is laid on the stage side 62, and the bonding head 26 of which semiconductor chip C adsorption was done moves to a wearing position by rotation of the head electrode holder 31

[0038] Next, the head section 6 descends by rotation of the rise-and-fall motor 11, and semiconductor chip C is laid on Substrate B.

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DESCRIPTION OF DRAWINGS

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[Drawing 1] It is the front view showing the head section.

[Drawing 2] It is the side elevation of the die bonder equipped with the head section.

[Drawing 3] It is the side elevation showing the head section.

[Drawing 4] It is the control-block view of a die bonder.

[Description of Notations]

3 Lifting Device (Rise-and-Fall Means)

6 Head Section

26 Bonding Head

28 Head Attaching Part

38 Learn and it is Field (Maintenance Angle Change Mechanism).

40 Engagement Side (Maintenance Angle Change Mechanism)

41 Hole (Maintenance Angle Change Mechanism)

43 Hole (Maintenance Angle Change Mechanism)

44 Support Arm (Maintenance Angle Change Mechanism)

45 Bearing Bar (Maintenance Angle Change Mechanism)

46 Tension Spring (Maintenance Angle Change Mechanism)

53 Chip Adsorption Side

55 Head Suction Valve

56 Chip Suction Valve

58 CPU (Control Means)

62 Stage Side

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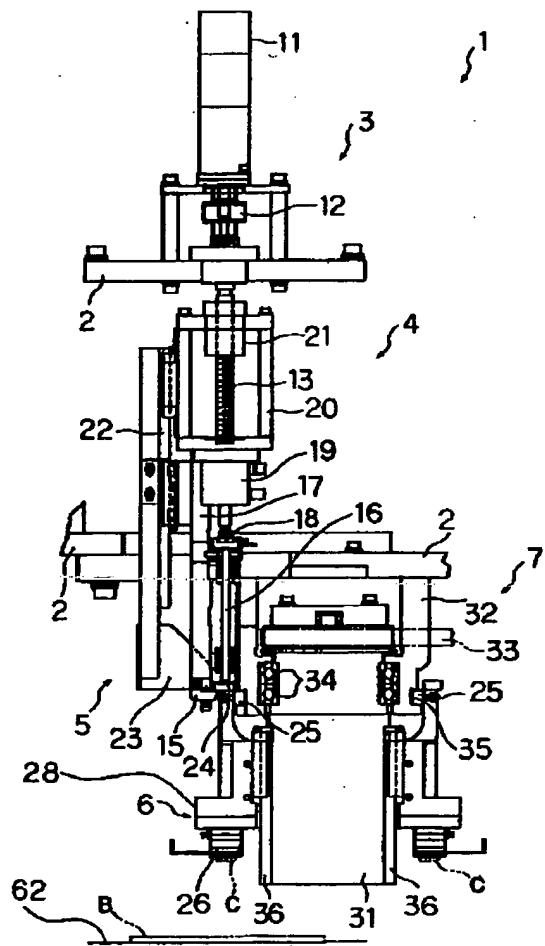
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